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## PEZIZA ODORATA.

Cups .5 to 3 in. broad, gregarious or scattered, thin, sessile, rather brittle when fresh, shallow expanded or even convex from the decurving of the margin, at first brownish, then white or whitish, the hymenium ochraceous-brown; asci cylindrical, opening by a lid, .01 to .012 in. long, .0006 to .0008 broad, paraphyses filiform, obscurely septate, slightly thickened at the tips; spores elliptical, even, .0008 to .0009 in. long, .0004 to .0005 broad.

Ground in a cellar. Maine. June. F. L. Harvey.

The plant when fresh has a peculiar fungoid odor suggestive of that of chestnut blossoms. The species is apparently allied to *P. Petersii*, from which it may be distinguished by its larger spores and distinct but peculiar odor. The spores also are not binucleate, as in that species. In drying, the hymenium is apt to become blackish.

## SLEROTINIA INFUNDIBULIFORMIS.

Cups thin, regularly infundibuliform, glabrous, stipitate, rugose, bay-brown; hymenium even, bay-brown; stem long, slender, flexuous, attenuated downwards, colored like the cup, sometimes a little darker toward the base, growing from a small wrinkled black sclerotium; asci cylindrical, 8-spored, .005-.006 in. long, .0004-.0005 broad; spores elliptical, .0005 in. long, .00025 broad; paraphyses filiform, slightly thickened at the apex; cups 3-4 lines broad and high; stem about 6 lines long.

Wet woods. Newfoundland. August. Waghorne.

## Further Observations on Antidromy.

BY GEORGE MACLOSIE.

It was shown in the BULLETIN of last year (p. 389, 466), by examples drawn from a large number of orders of Phaenogams, that there are probably two castes, a dextrorse and a sinistrorse, of every species. This "antidromy" was also traced generally to a diversity of the embryo in the seed, depending on whether it grows on one or other margin of a carpellary leaf. A further explanation, then only suggested, proves to hold in many cases: namely, that a forking rootstock produces antidromic plants on the two branches of the fork. This last explanation applies to such cases as *Richardia*, *Podophyllum*, *Nuphar*, *Helonias*, *Chaemae-*

*lirium* and many other Liliaceae, and *Carex* (whose tussocks, arising from a common stock, consist of relatively antidromic plants). This fact may have a bearing on the problem of homology of seeds and root-buds, and may suggest a diversity between subterranean and ordinary cauline buds.

During the past summer I have enlarged my range of observations on this subject by help of the great botanical gardens and museums of Europe, and have found light on some difficult points.\* Among the numerous additional evidences of antidromy I may cite many Cactaceae (as *Mammillaria*), *Tamarix Gallica*, Screw Pines (*Pandanus utilis*, etc.). and generally the palms. Dr. Urban, of the Berlin Botanische Museum, has published papers on the spirally twisted fruits of species of *Medicago*, and of certain genera of Loasaceae. His monograph of the genus *Medicago* shows that most of the species have a sinistrorse twist, a few (as *M. tuberculata*) mostly dextrorse; and he knows of no clear case of one individual plant having two kinds of twists among its fruits. These results on the whole harmonize with the general rule of antidromy; and they seem to be well established by his large collection of specimens which he kindly showed me. I also examined living specimens of this genus in the Botanische Garten, but failed to correlate the spirality of the fruits with the phyllotaxy of the plant which bore them: this failure was due to the difficulty of deciding the order of phyllotaxy of such straggling plants. His paper on *Loasaceae* brings out the interesting facts that in some of the species the fruits are spirally twisted, the direction of the twisting being either one for a species (several species of *Cajophora*), or constant in a genus (*Blumenbachia*) and dextrorse or locally specialized, all the plants from one locality being alike, but different for the same species between different localities (*Sclerothrix*); or the fruits following one another in one specimen may be antidromic (species of *Cajophora*).

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\* I beg to express my thanks for courtesies extended by the officers of Kew Gardens, England; of the Jardin des Plantes, Paris; by Mr. F. A. Bather, of the Natural History Museum, London; Herr Otto Müller, of the Botanische Garten of the University of Strassburg; and Dr. Ign. Urban, of the Museum der Koenigl. Botan. Garten of Berlin. I may explain that in quoting Dr. Urban I render his word "dextrorse" by "sinistrorse" and conversely, so as to turn his terminology into conformity with our method of designating the spiral thread of a common screw as "dextrorse."

Of these plants I examined the living *Blumenbachia hieronyma* Urb., and found that whilst all its fruits were dextrorsely twisted, as he had stated, its foliage shows true antidromy. Though the leaves are opposite, only one of a pair bears an axillary pedicel, and in some plants the leaves having a pedicel form a dextrorse, in others a sinistrorse spiral. Thus the plant is found to have antidromy in its foliage, and monodromy of its carpels. (In other cases, *e. g.*, *Impatiens*, and *Prosopis* carpels as well as foliage are antidromic and very frequently the anthotaxy, or order of growth of the components of an inflorescence, is antidromic.)

There are very many torsions in plants which have no relation to antidromy, and which are usually constant in all individuals of a species; as is *Convolvulus*, *Hop*, etc. *Canna* proves to be of this kind; its numerous species and many thousands of specimens growing in the Jardin des Plantes, all have the young leaves *directly* enfolded (that is clock-wise); *Musa* is similar, but the case is different with *Aloe*, as all its young leaves are folded in the same direction in one plant, but antidromically as between different plants.

The trunks of the Horse Chestnut, and of *Catalpa*, are always twisted dextrorsely; this is best seen in old trees, and is very obvious in the miles of old trees of Horse Chestnut, which extend from St. Cloud towards Versailles. Each trunk is fluted and strengthened by rounded pilasters representing the continuation downwards of the large branches, and always dextrorsely twisting. As the leaves are opposite, we cannot readily determine the order of phyllotaxy. But the seeds even when viewed from the outside are easily seen to be of two kinds, the radical of one turning towards your right, of the other towards your left. Even the small winged seeds of *Catalpa* have a mark which betrays the diversity; and also the opposite leaves of *Jacaranda obtusifolia* H. B.K., of the same Bignoniaceous order with *Catalpa*, has its opposite leaves arranged in spiral orthostiches, which leave no doubt as to the antidromy.

The leaf-scars and cone-spirals of Gymnosperms conclusively prove their title to a place in the realm of antidromy, not only the pines and araucarias, but the various genera of Cycads, as *Cycas*, *Zamia*, *Ceratozamia*, *Encephalartos*, are uniformly anti-

dromic (the peculiar habit of Gnetaceae obscures the evidence with them). Of still greater interest were the coal-plants and the modern tree-ferns. In the South Kensington Museum of Natural History I found *Lepidodendron Sternbergii* and *Sigillaria tessellata* clearly antidromic, the leaf scars forming different spirals, and sinistrorse and dextrorse specimens of each being seen. Of the fruits of *Palaeoxyris carbonaria* some were twisted in one way, some in the other way. The fact that some of the fossils have regularly bilateral markings received a curious illustration from the tree-ferns. We have in Princeton a piece of fern-stem (an *Alsophila*) with its scars absolutely symmetrical. But in Kew Gardens Museum and in one of the greenhouses in Paris I saw tree ferns (*Cyathea Schauschii* Mart. and *Alsophila Brunomiana* Wall.) having about 10 feet of the lower part antidromic, that is dextrorse and sinistrorse in different plants, and the upper part of the same stems closely beset with symmetrically placed scars. This shows how the primitive antidromy may become exhausted, and may disappear, or even as in *AEsculus*, may be overlaid by a different kind of spirality subsequently acquired.

I should add that Herr Otto Mueller of the University Gardens of Strassburg informed me that he has often observed the duplex order of phyllotaxy, though he had never seen any reference to this in print.

PRINCETON, September 29, 1896.

### Botanical Notes.

*Coleosporium Campanulae* (Pers.) Winter. While visiting at Earlville, Madison county, N. Y., the present summer, I found the common *Campanula rapunculoides* everywhere covered with this fungus, which does not seem to have been reported from this country, although it is common in Europe on this and other members of the *Campanulaceae*. Subsequently Mr. F. L. Stevens has sent me some of the same fungus collected at Jamesville, Onondaga county, N. Y. It is likely to be found elsewhere as soon as attention is called to it.

L. M. UNDERWOOD.